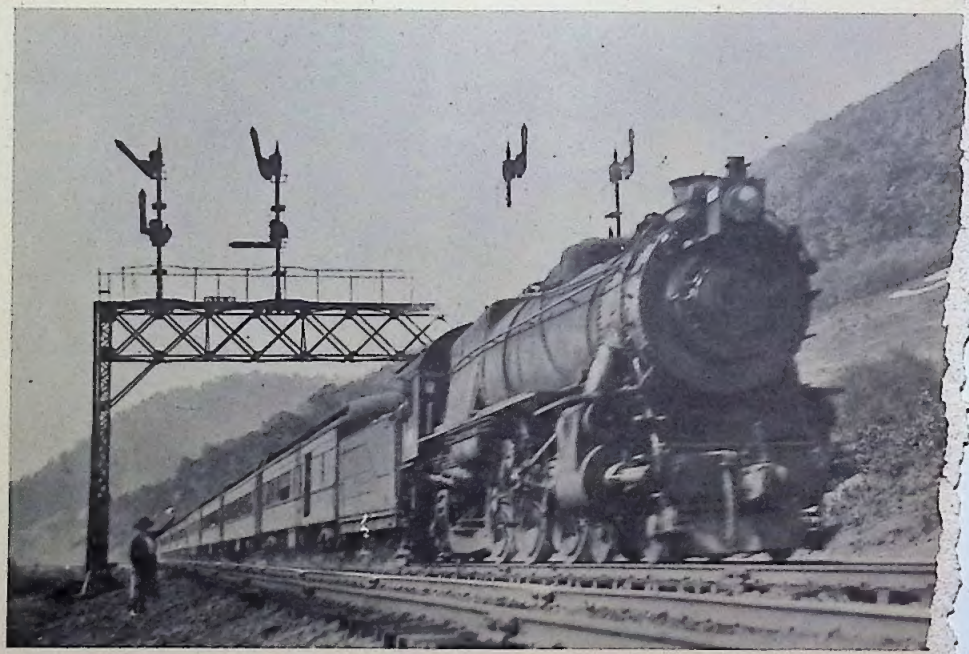
PENNSYLVANIA RAILROAD

K-4s

- TEXT BY MOTIVE POWER DEPT.
- SOME OF THE EARLY ENGINES
- ON THE PRR
- LINES WEST
- BROAD ST. STATION FIRE 1923
- TENDERS
- LONG DISTANCE TENDERS
- SCALE DRAWINGS
- 136 ON HIGH DOE CURVE
- SOME MODIFICATIONS
- TECHNICAL
- PHOTOS



Steam Locomotives of Yesteryear

COVER

Rolling down the Alleghenys, train 44 with engine 122 on the headend was bound for New York when Charles B. Chaney took this picture sometime in 1922.

G. F. Nixon Collection

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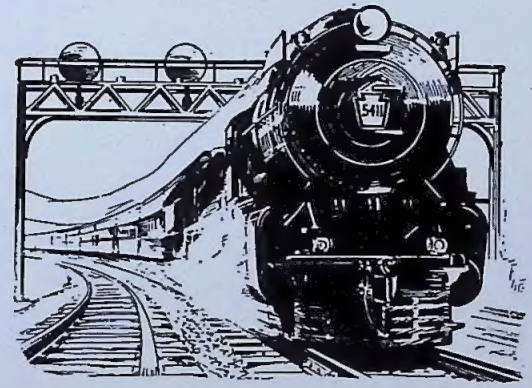
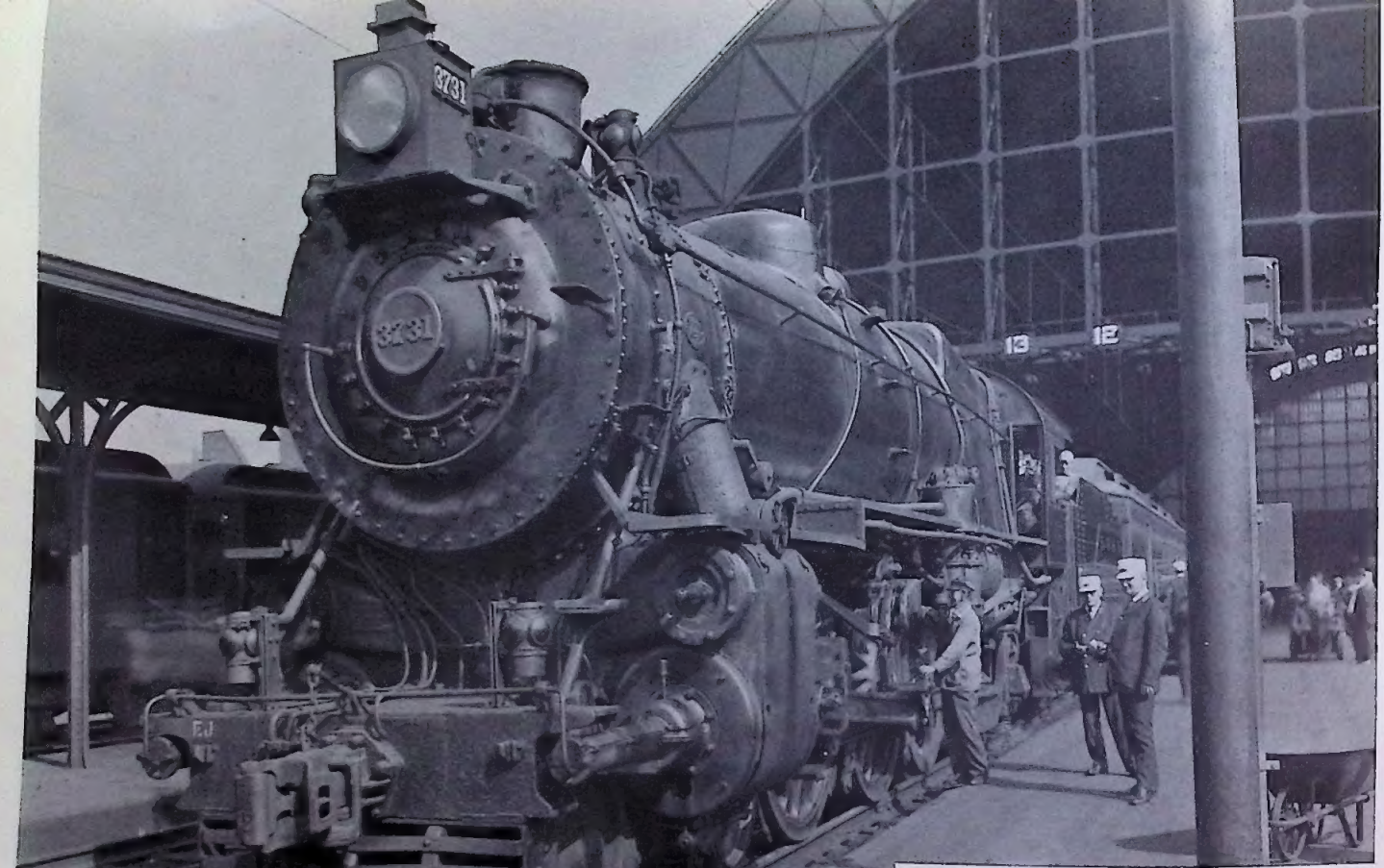


CENTER SPREAD
Working Drawings of Locomotives
Permission Simmons-Boardman Co.
New York, N.Y.

A PICTURE STUDY OF THE K-4—INCLUDING SPECIFICATIONS, TEXT, TENDER DATA, DRAWINGS, ROSTER AND OTHER INFORMATION ABOUT THE FAMOUS LOCOMOTIVE.

OCTOBER, 1967

Compiled, edited and published by
HARRY P. ALBRECHT
Publisher of Steam Locomotives of Yesteryear



(Pennsylvania Railroad)

What could be more "PENNSY" than a K-4 in the famous Broad Street Station, in Philadelphia, Pa.? Here we see engine 3731 about ready to depart with a New York Express sometime in the twenties.

By PRR MOTIVE POWER DEPARTMENT

THE first Pacific 4-6-2 wheel arrangement locomotive built for the Pennsylvania was completed in 1907 and from that date to 1913, a total of 271 Pacific type locomotives of 5 different designs were built. In 1914 the first Pacific type locomotive of a new design, classified as the K4s was built at Altoona. This locomotive combined the best features of the previous designs with the addition of what was then new thinking in the art of locomotive building.

Interest in the Pennsylvania K4s locomotive has been stimulated over the years by its distinctive appearance and preformance. The Belpaire boiler and simplified piping system gave it clean functional lines at a time when smooth surface consciousness had not yet brought the word "streamlining" in general use. The light weight design of Walschaert valve gear for the K4s was first used on the Pennsylvania class E6 Atlantic type locomotive. While it was designed to reduce maintenance, it also enhanced the appearance of the running gear.

When tests at the Altoona Test Plant and service experience showed the K4s' performance to be so remarkable, this class was built in quantity. In all, 425 K4s locomotives were built which is the largest number of steam passenger engines of one class to be built by any railroad in this country.

It was designed for a maximum speed of 100 m. p. h. at a time when 60 m. p. h. was considered high passenger train speed. Consequently, as train speeds and weights were increased, the K4s was able to meet the new schedules without any design changes. The original 7000 gal. tender was replaced by 11,000 gal. tenders to provide for increased working rates. Tenders having a water capacity of 21,000 gal. were also used experimentally. This locomotive has been assigned to haul such trains as the Broadway, the Congressional, the Spirit of St. Louis and the "clocker" trains between Philadelphia and New York where speeds of up to 80 m. p. h. are common. These trains and all other heavy passenger trains, were hauled for years by this class locomotive until replaced by Electrics, Class T1 steam locomotives and more recently Diesels.

The first K4s locomotive, numbered 1737, was, as previously mentioned, built in 1914. It was not originally equipped with a stoker, which was subsequently applied; but, except for refinements incorporated into the design over the years, it was essentially the same as the last of this class locomotive built in 1928. In addition to stokers, such features as power reverse gear, roller bearings, improved drafting, improved injectors, cab signals and train telephone were added later.

The weight on three pairs of 80 inch diameter driving wheels is 209,300 pounds. The total weight of locomotive and tender in working order is 541,500 pounds. With 205 p. s. i. boiler pressure the 27 inch by 28 inch cylinders develop a starting tractive force of 44,460 pounds. The coupled length is 82 feet 11¾ inches.

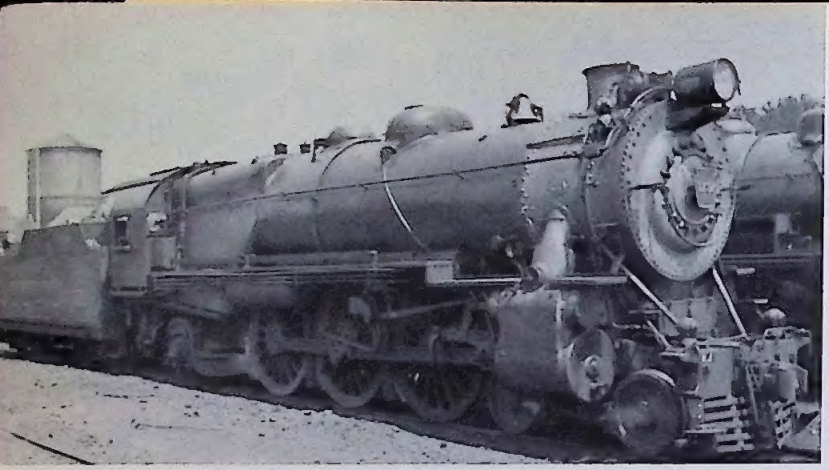
As the K4s locomotive is a free steamer, practically no trouble with steam failures has been experienced. So well has this boiler been drafted that in one test at the Altoona Test Plant the extremely high firing rate of 19,226 pounds of coal per hour was reached, which equals 277.4 pounds of coal per square foot of grate surface. This rate, of course, means the boiler is being forced beyond a reasonably efficient rate, but shows the draft capacity of the front end to be well beyond ordinary requirements.

The Northbound Congressional Limited about 45 MPH with engine 1433 passing Loudon Park, Baltimore, Md. on May 30, 1919.

G. F. Nixon Collection

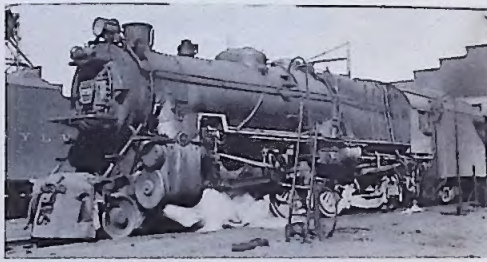
Not far from the same location train 146 passes Halethorpe, Md. Engine 3801 April 19, 1931.

Sommerville Collection



Although NJ is marked on its pilot, there is no information as to when or where this picture of the 1737 was taken. While it has been somewhat "modernized," we note it still has the hand reverse.

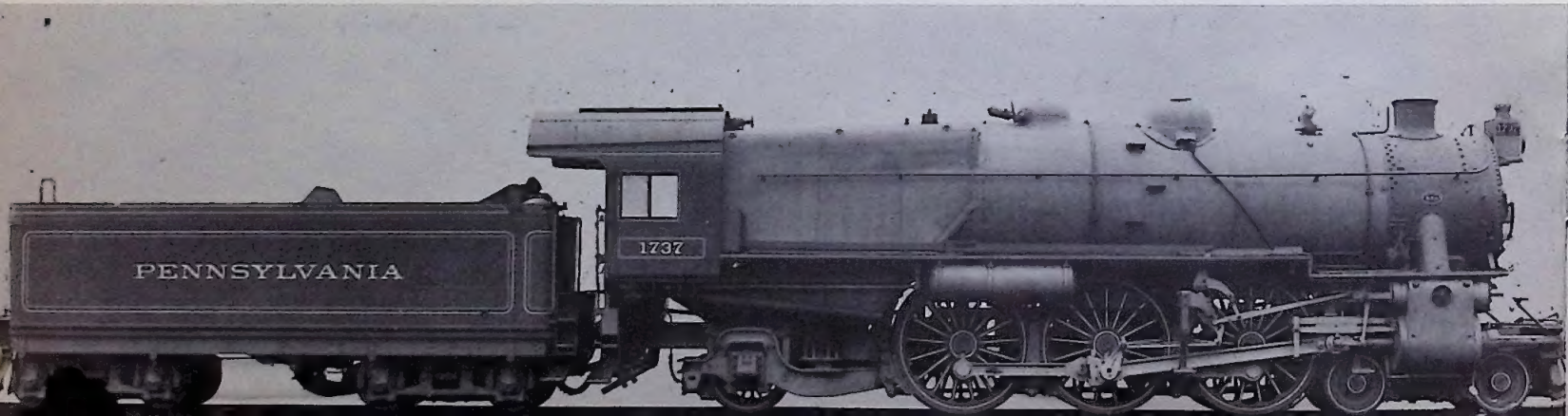
It is interesting to note that the 1737 lost its identity to engine 3750. From the Sommerville collection we see this engine at South Amboy, N.J. as it appeared February 22, 1956 when taken by F. A. Bonke.

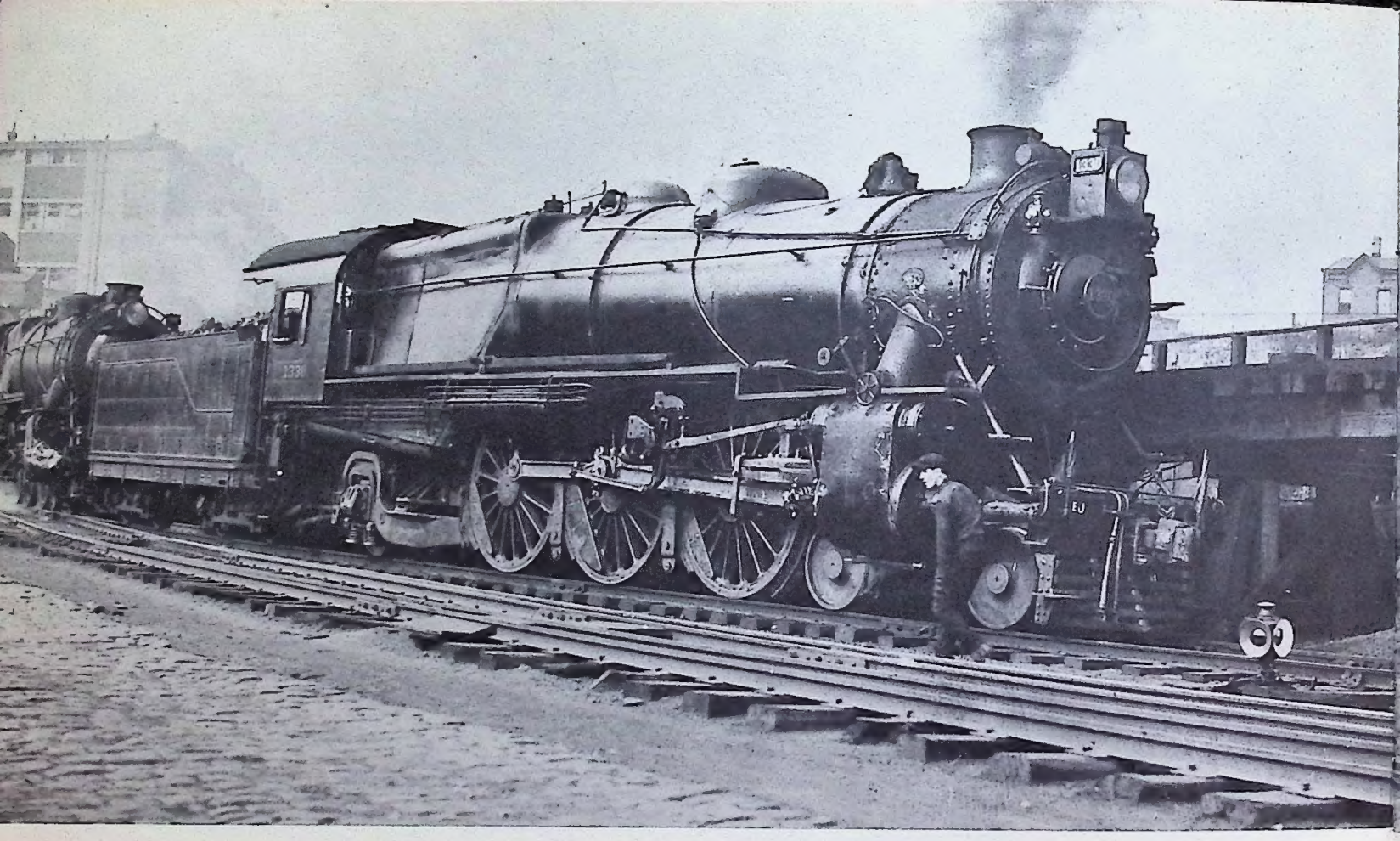


No. 1737—FIRST K-4

Although this builder's photo of the 1737 has been seen many times it is shown here for comparison.

(Pennsylvania Railroad)





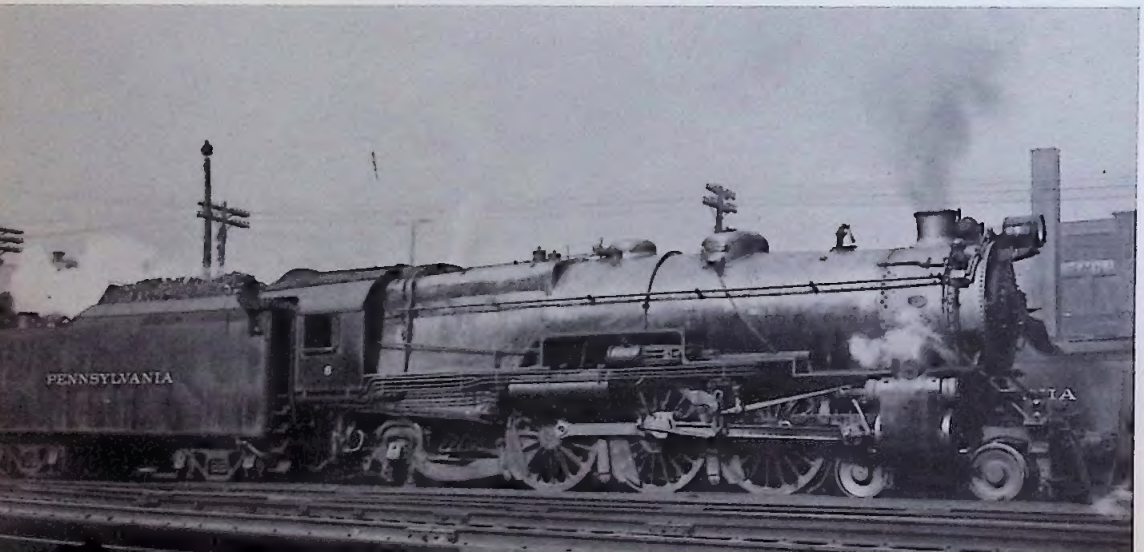
Here is an excellent study of the 1330 at Jersey City, N.J.
September 1, 1923 from the G. F. Nixon Collection.

Smithsonian Institution

Engine 295 in the Alleghenies June 1920. Have you noticed this locomotive has steam reverse?

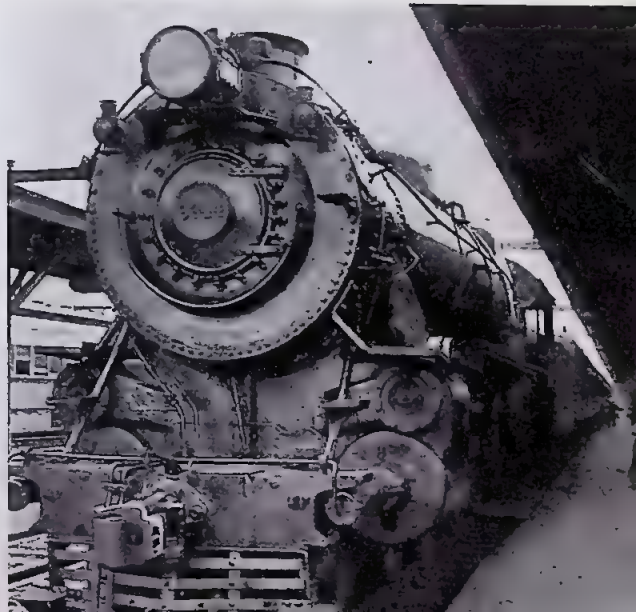
LOWEST NUMBER K-4

Fireman's side of No. 8 taken by M. Flattley, Jr. November 7, 1937 at Philadelphia, Pa.



And the engineman's side, Pittsburgh, Pa. 1939.

This picture of the 5357 (1924) is from the G. F. Nixon collection.



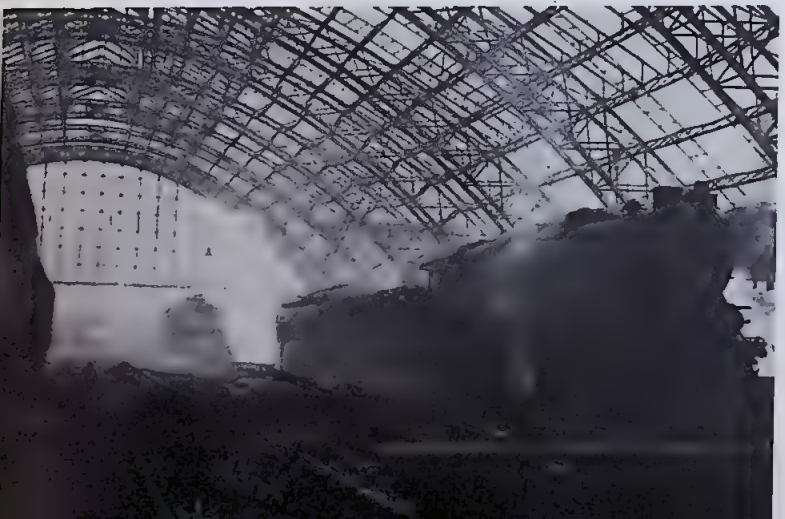
A study of engine 5344 shows the cylinderical electric headlight has been mounted on the platform which carried the old oil burning headlamp, placing it in an odd position. This is a reprint from an early PRR Publication "INFORMATION" dated September 1924.

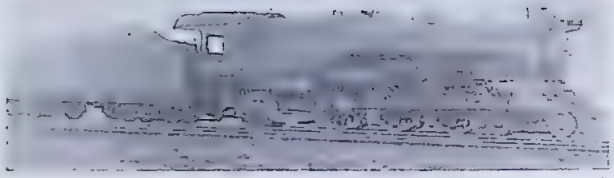
PENNSYLVANIA
5498

Both of these pictures showing engines 2445 and 5427 were taken by G. B. Ritz as the trains passed Absecon, N.J., sometime in 1940.

Albrecht Collection
Permission Trains Magazine—Kalmbach Publishing Co.

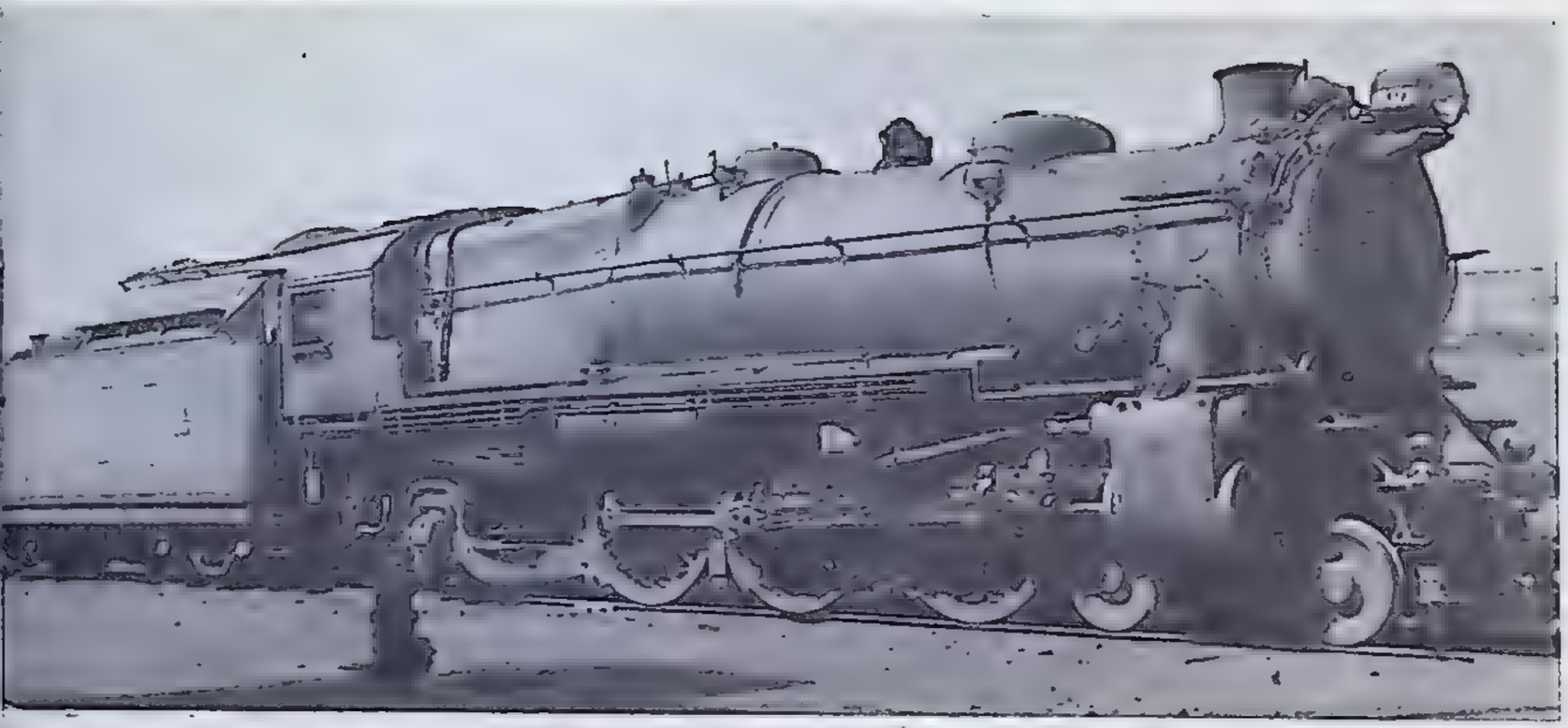
On June 11, 1923, the train shed of the Broad Street Station in Philadelphia, Pa., as seen above, was destroyed by fire. Two K-4 locomotives and their trains were trapped in this fire as shown in these rare pictures furnished by E. P. Alexander. The engine in the lower pictures is No. 3681. However, the number of the engine in the other picture is unknown.



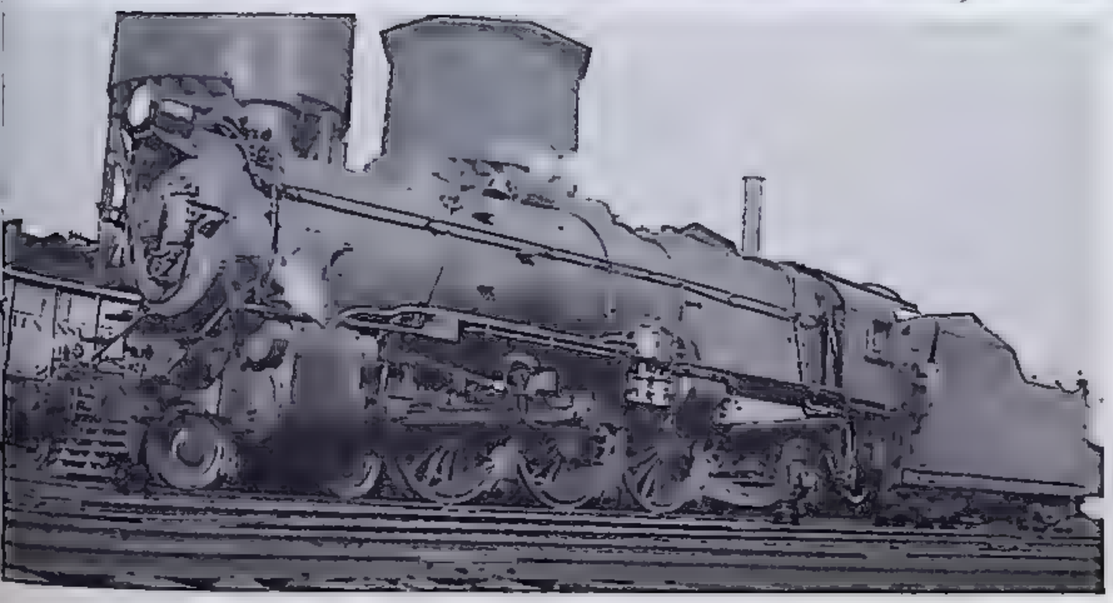


This is the 3681 at Trenton, N.J. picture taken by J. M. Prophet, 3rd, sometime in 1937. Of particular interest is its 70-P-70a tender.

And as it appeared at Bay Head Junction October 1949, with a 130-P-75 tender. Picture by M. Flattley, Jr.



From the camera of J. M. Prophet, 3rd, we have engine 8373 with class 90-P-84 tender at Altoona, Pa., April 4, 1934.



This is the highest number K-4. Engine 8378 at Pittsburgh, Pa., November 6, 1938.

No information on Engine 8278.

Here is the eastbound Golden Arrow (Chicago-New York) headed by engine 8225—date unknown.

Enginemen's side of 8122 taken by M. Flattley, Jr., in Pittsburgh, Pa., May 8, 1934. Tender class 90-P-84.

Another of Flattley's pictures showing the fireman's side of PCC&STL engine 8309 in Pittsburgh, Pa., 1933. Tender class 90-P-84.

TENDERS

Many classes of tenders were used with the K-4 locomotives. Just a few are shown here.

70-P-70—engine 43—1922. Smithsonian Institution.

70-P-70a—engine 3841—August 1939. Ritz collection.

In this classification, tenders are given a primary number to designate the approximate water capacity in hundreds of gallons for the original design, a letter to denote the type, and also a number to indicate the height of the deck plate in even inches above the rails. Small suffix letters are used to indicate modifications in class of tender. Thus: 70-P-70 indicates 7000 gallons of water, passenger tender and 70″ deck plate, while 70-P-70a indicates a change in the original design.

CLASSIFICATIONS	70-P-70	70-P-70D	110-P-70	110-P-75A	250-P-75
Water capacity, gallons	7300	7850	12150	11300	24410
Coal capacity, pounds	32600	27100	36000	43600	50240
Frame	CHANNEL	H-BEAM	CAST STEEL	CAST STEEL	CAST STEEL TANK BOTTOM
Truck classification	2D F18	2E T4 2D T4	2F T2	2F T2	3F 3T4
Length of tender, total	31-2½	31-2½	32-3½	33-7½	55-5¼
Height rail to deck plate	70	70	70	75¼	75¼
Weight, empty	69150	78800	75500	83700	142180
Weight, loaded	162800	171400	212725	221500	395835

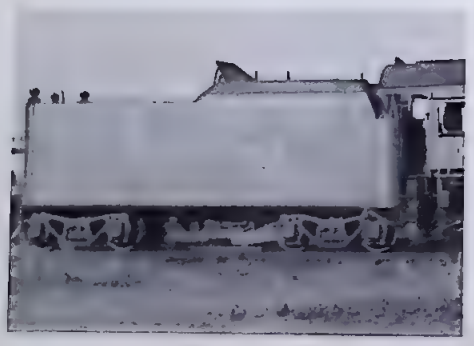
TENDERS

70-P-70b engine 43, October 1936

70-P-70d engine 16, July 1936

90-P-70 engine, 3748, August 1935

90-P-84 engine 8278, July 1938



110-P-70 engine 1588, October 1935

110-P-75a engine 5464, November 1937

All pictures by J. M. Prophet, 3rd

LONG DISTANCE TENDERS

This is the Liberty Limited (Chicago-Washington) in Chicago, Ill., with locomotive 5493. Tender class 250-P-75. Taken by M. Flattley, Jr.

These K-4 locomotives were equipped with Long Distance Tenders.

5453	3772	5432	5385
5493	5341	5442	5495
5365	5365	5422	

LARGE ENGINE TENDERS BEING TESTED BY P. R. R.

Have Water Capacity of 25,000 Gallons and Can Carry 25 Tons of Coal

Two of the largest locomotive tenders ever operated in passenger train service on any railroad are now in experimental use on the Pennsylvania Railroad between Philadelphia, Pittsburgh and New York.

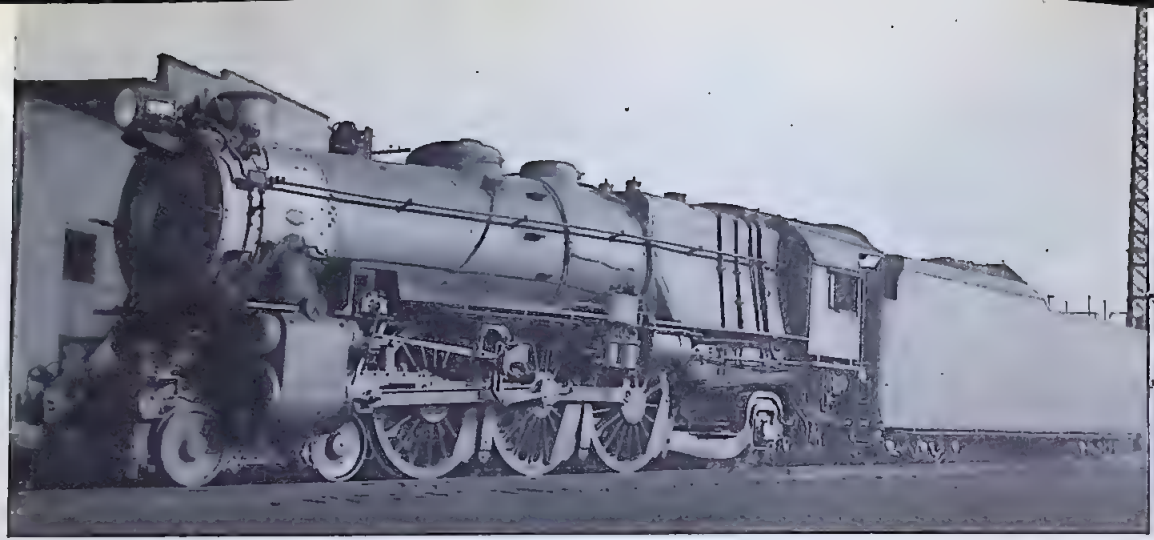
They were designed primarily with the expectation of eliminating all passenger train delay due to stops for water and coal on long runs. These giant tenders, 55 feet 5¼ inches long, are being tried out in various parts of the railroad to determine their efficiency under every condition of train operation.

The new tenders have a water capacity of 25,000 gallons, a coal capacity of 25 tons, and weigh 395,800 pounds fully loaded. They carry as much coal as the standard gondola car in the regular coal trade of fifty years ago.

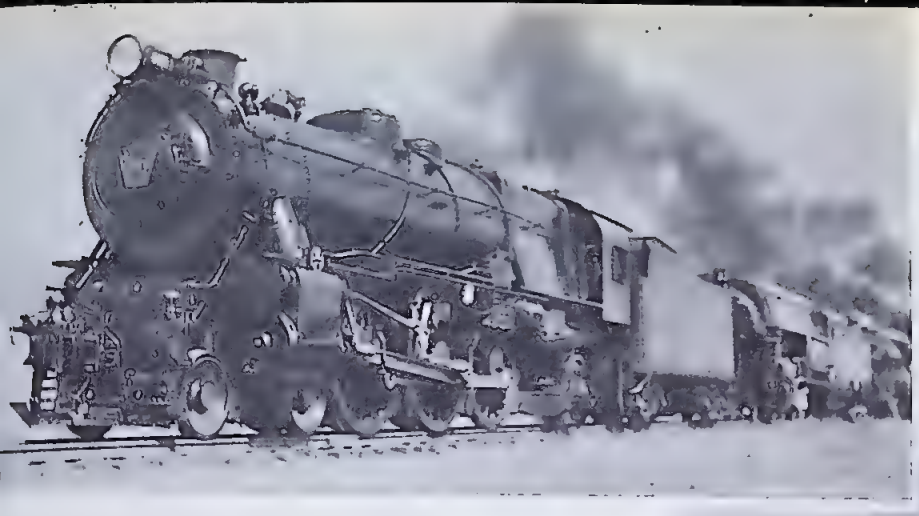
A comparison of the Pennsylvania's first tender, which served the John Bull locomotive back in 1831, with the modern 25,000-gallon tank is illuminating. The primitive tender was a sheet iron cylinder six feet in diameter, six feet high, standing on a small flat car. It held 1150 gallons of water. The diminutive tender weighed 19,600 pounds, one-twentieth the weight of the latest model.

Reprinted from "Pennsylvania News" a PRR Publication about 1930.

5341 at Harrisburg, Pa. Taken by M. Flattley, Jr., October 4, 1940.



On July 1, 1940, while in Altoona, Pa., M. Flattley, Jr. saw the 5442.

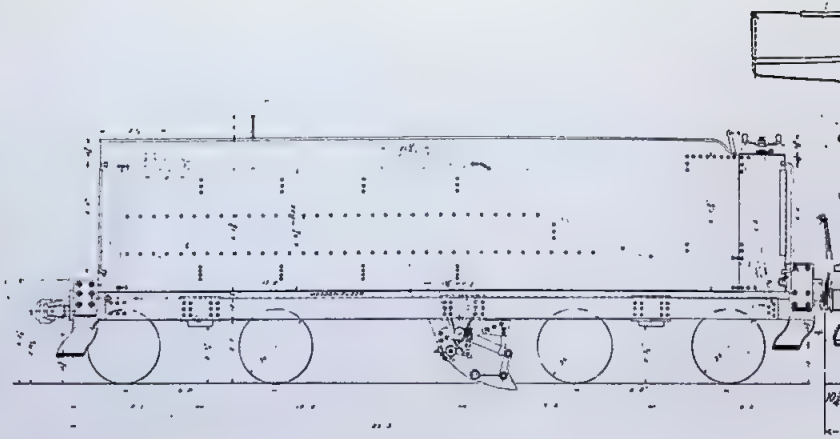


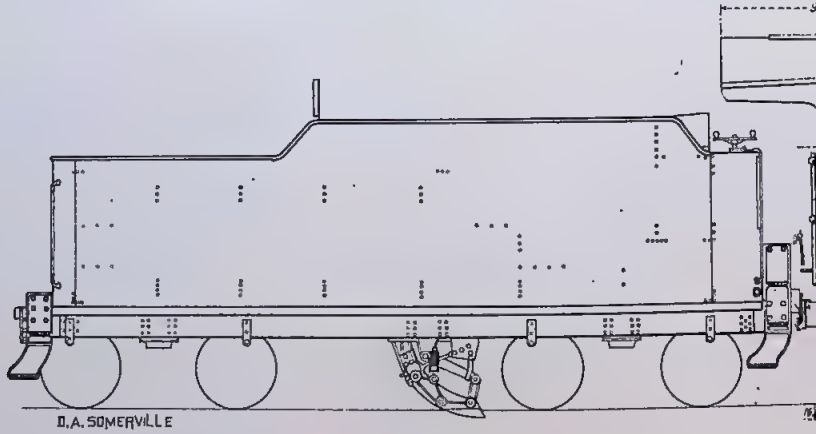
To commemorate their one hundred years of service the Baltimore & Ohio Railroad staged the "Fair of the Iron Horse" at Halethorpe, Md., in 1927. To this pageant the Pennsy sent the beautiful 5475 fresh from the Altoona Works. From the Sommerville collection we see the locomotive on exhibition with other visiting engines.

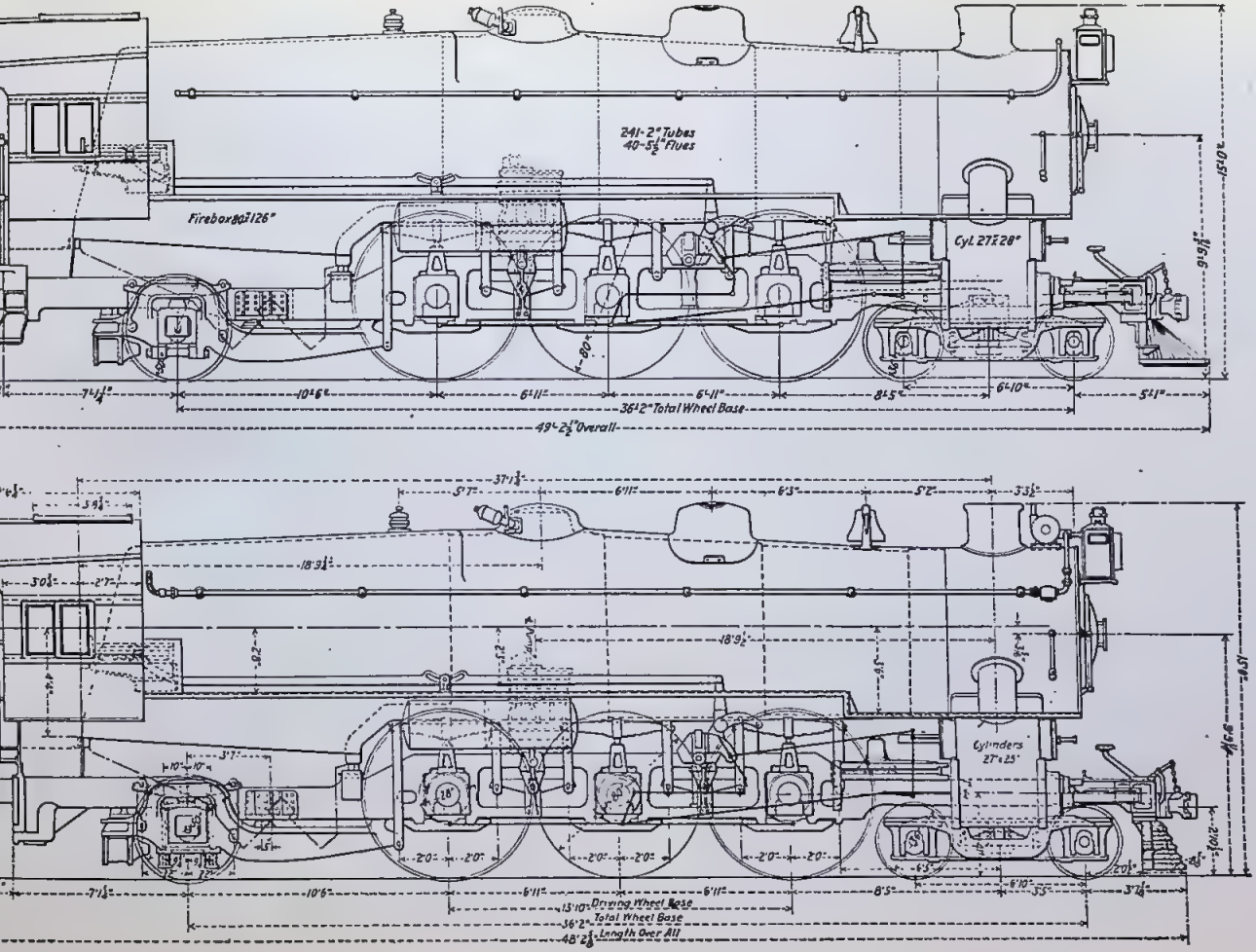
A little unusual but here we have two K-4 locomotives, 3870 and 5440, doubleheading a freight train of 110 cars near Chicago, Ill., August 1, 1938. A luck shot by M. Flattley, Jr.

No. 5022 G. F. Nixon Collection

No. 958 Smithsonian Institution






241-2" Tubes
40-5½" Flues
Firebox 80"x126"
Cyl. 27"x28"
15'0"
9'9½"
7'1¼"
10'6"
6'11"
6'11"
8'5"
6'10"
5'1"
36'2" Total Wheel Base
49'-2½" Overall
37'1½"
5'7"
6'11"
6'3"
5'2"
3'3½"
18'3½"
18'9½"
Cylinders
27"x25"
15'0"
9'6¼"
10'4"
3'7"
2'0"
2'0"
2'0"
2'0"
2'0"
2'0"
6'3"
6'10"
3'5"
3'7¼"
7'1¼"
10'6"
6'11"
6'11"
8'5"
15'10½" Driving Wheel Base
36'2" Total Wheel Base
48'2½" Length Over All

ON THE HORSESHOE CURVE

Engine 295

G. F. Nixon Collection

Smithsonian Institution

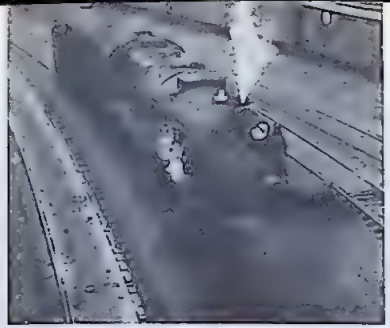
No. 15—Fast Mail doubleheaded westbound on the curve. Engines 1517 and 262—about 1922.

Train No. 8 descending the Alleghenies. At the head end is engine No. 452.

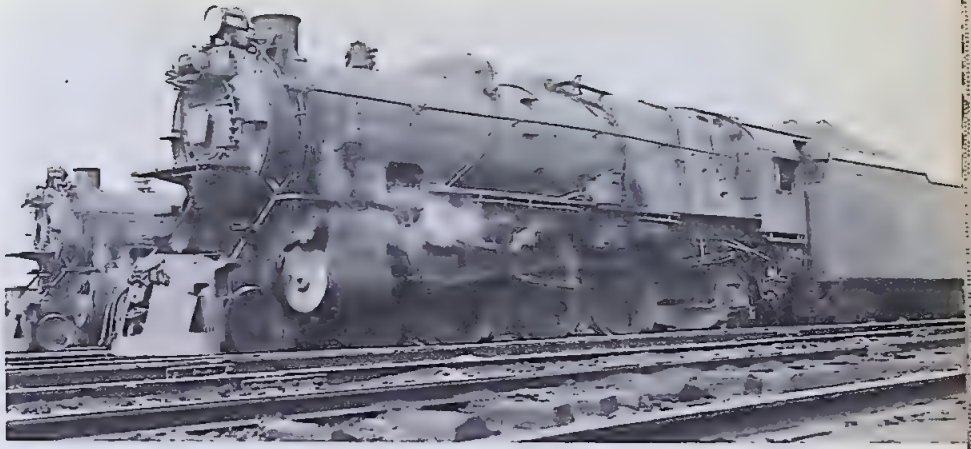
G. F. Nixon Collection

G. F. Nixon Collection

And here is train No. 23 climbing the Alleghenies with engine No. 962.



The 1361, about 1932, at the 46th St. engine house, in Philadelphia, Pa.



Meadows, N.J. engine house, April 20, 1955, as seen by E. A. Bonke.

A few changes have been made as we see the 1361 some years later. Both pictures from the Sommerville Collection.

And at South Amboy, N.J., November 13, 1954, as seen by John Locke.

THE HORSESHOE CURVE

Just a word about the Horseshoe Curve which is located on the eastern slope of the Allegheny Mountains, approximately 5.5 miles west of Altoona, Pa., and is 6.3 miles east of Gallitizin. The length of the curve is 2,375 feet; degree of curvature 9° 15′; central angle 220°; elevation at the east end, 1,594 feet from sea level. The grade is 91 feet per mile. It was built in 1852, the year in which the Pennsylvania Railroad was continued over the Allegheny Mountains, and opened to traffic February 15, 1854.

THE MEMORIAL LOCOMOTIVE

G. F. Nixon was on hand during the placement of the 1361 on the Horseshoe Curve in June 1957.

K-4 Locomotive No. 1361 is an especially appropriate memorial for the City of Altoona, where five generations of skilled workmen built a total of 6,783 steam locomotives for the Pennsylvania Railroad.

Of all these engines, the K-4 Class is undoubtedly the most famous ever turned out of the PRR's Altoona Works. The K-4's were not the biggest or the most powerful of the Pacific types, but on the Pennsylvania they were considered the pinnacle of perfection for fast passenger service. One such engine could haul from 13 to 18 steel cars at speeds that at times topped 90 miles an hour, and they handled the mountain grades with ease.

No. 1361 was one of the earliest of the 350 K-4's built at Altoona. It was placed in service May 18, 1918 and for more than 35 years it hauled trains of the great Pennsy passenger fleet over the main line between New York, Harrisburg, and Pittsburgh. Countless of its trips were around Horseshoe Curve. When it was finally retired to make way for the modern Diesel, No. 1361 had rolled up 2,469,000 miles—the equivalent of nearly 100 trips around the world.

Courtesy of the "PENNSY"—PRR Publication

It is June 8, 1957, the day the 1361 was dedicated to the City of Altoona by the Pennsylvania Railroad as a permanent monument to the historic partnership between the community, the railroad and the Iron Horse.

Courtesy PRR Mutual Magazine

The 3768 approaching the Rockville Bridge, near Harrisburg, Pa.

At the New York World's Fair in 1939 the 3768 was exhibited with the Baltimore & Ohio William Mason Engine No. 25 and the Best Friend of Charleston.

Courtesy of PRR Mutual Magazine

Upper right—Some years later F. A. Bonke took this picture showing how it appeared at Burlington, N.J., in June of 1951. From Sommerville Collection

First highspeed, streamlined luxury coach trains ever operated between New York, Philadelphia and St. Louis were inaugurated by the PRR on Sunday, April 27, 1941. Named in both directions "The Jeffersonian," these new trains provided daily west and eastbound service in completely air-conditioned equipment of the most modern type, including their streamlined K-4 locomotives. Both of these pictures are from the G. B. Ritz Collection.

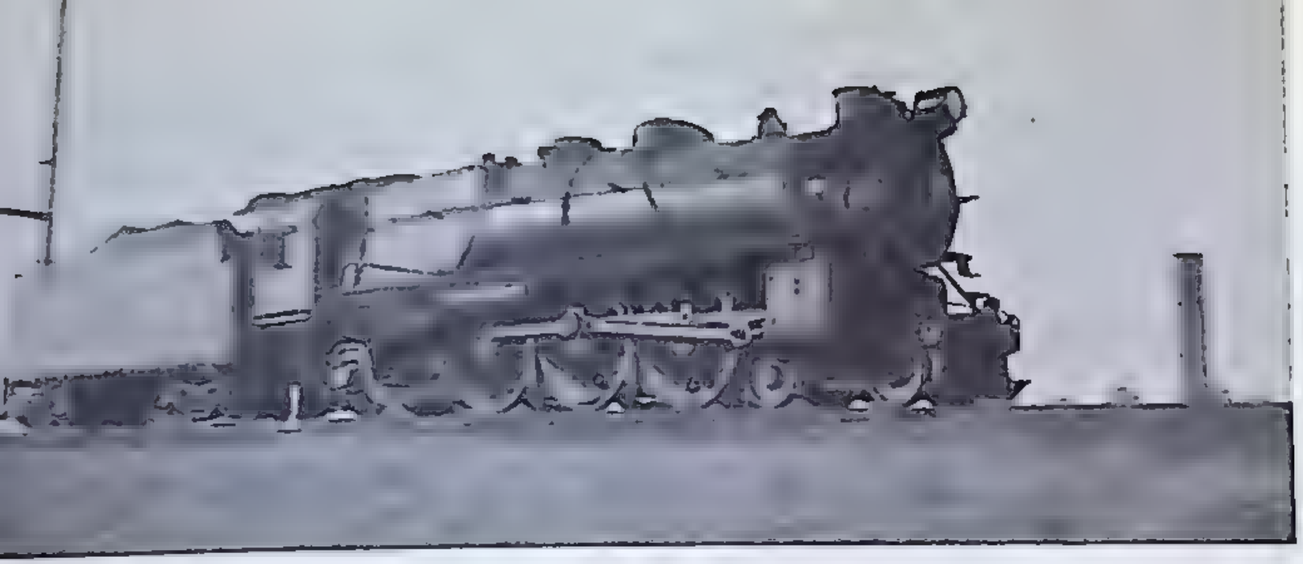
Engine 5338 in East St. Louis in 1942.

Engine 3678 at East St. Louis, Ill., in 1940.

Trains Nos. 308 and 309, "The South Wind" between Chicago and Miami, operated over the PRR from Chicago to Cincinnati every third day. This is the 2665 at Cincinnati, sometime in July 1940.

What's this? Look carefully at the stack and you will see that the 3755 is equipped with "Air Horns." A G. F. Nixon picture, Baltimore 1948.

Wonder why the 837 had an L-1 stack when this picture was taken at Washington in 1931? By G. F. Nixon.

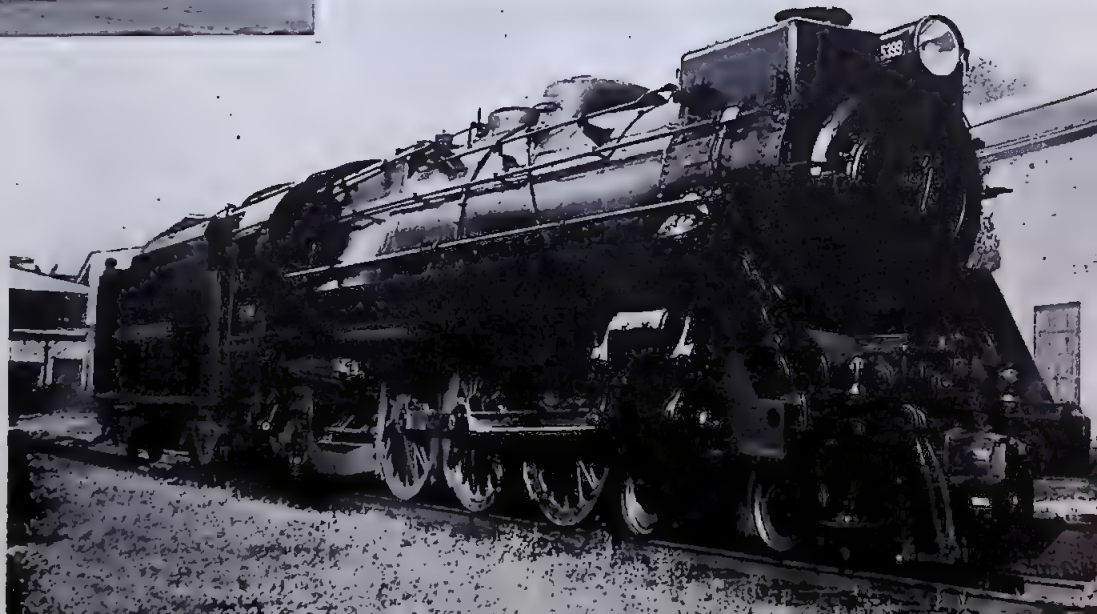


Equipped with Rotary Valves and an unusual steam dome, here is engine 5436 at Baltimore, Md., as seen by G. F. Nixon in 1946.

. . . and as it appeared when he saw it in 1942. Note the difference in type of cylinders.

Both pictures are from the Sommerville Collection and their specifications will be found on page 38.

The 3847 was built in the Juniata Shops June 1923. Here we see it in 1950 at Cincinnati, Ohio, equipped with Franklin Rotary Cam valve motion.



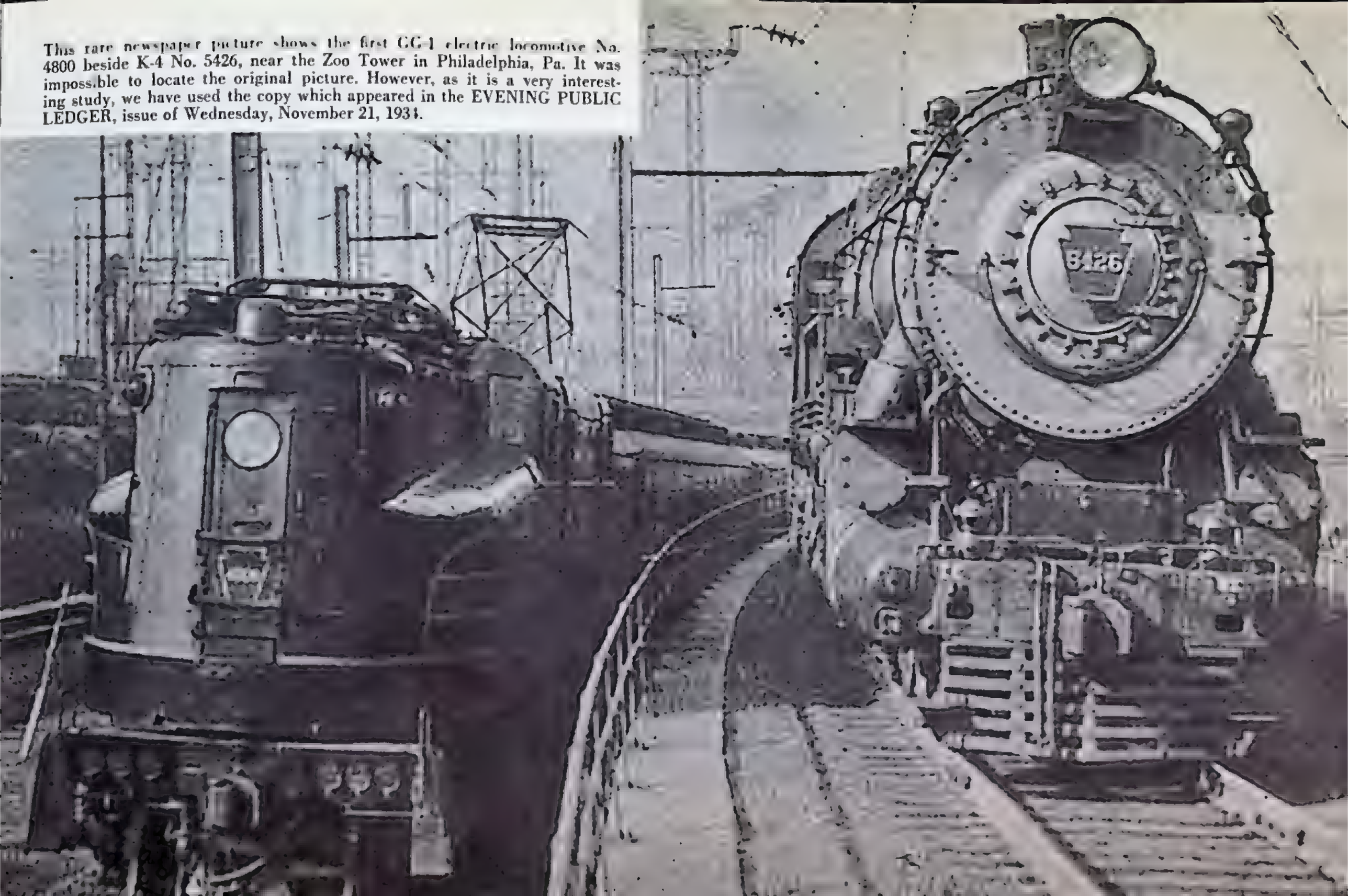
As you will observe 5399 has Franklin Oscillating type of valve gear.

The specifications for engine 5484, which is a K-4sa, may be studied on page 38. G. F. Nixon found it in Harrisburg sometime in 1948.

This picture, from the Sommerville Collection, was taken by W. A. Schwartz as the 1188 made a station stop at Logansport, Ind. sometime in April 1948.

Now let's study the 3676. We note that this engine does not have the familiar KW trailing truck but that it is equipped with a Delta trailing truck on which is mounted the brake cylinder. Also of interest is the fact that this trailing truck is a booster and the exhaust can be seen coming up behind the stack. This locomotive hauled the BROADWAY LIMITED for many years. Another picture from the G. F. Nixon Collection.

This rare newspaper picture shows the first CC-1 electric locomotive No. 4800 beside K-4 No. 5426, near the Zoo Tower in Philadelphia, Pa. It was impossible to locate the original picture. However, as it is a very interesting study, we have used the copy which appeared in the EVENING PUBLIC LEDGER, issue of Wednesday, November 21, 1931.



CLASSIFICATION		K 4 s a	K 4 s	K 4 s No. 5399	K 4 s No. 3847
Wheel Arrangement		4-6-2	4-6-2	4-6-2	4-6-2
Wheel Diameters	In.	36, 80, 50	36, 80, 50	36, 80, 50	36, 80, 50
Journal, Engine Truck	In.	6½ x 12	6½ x 12	6½ x 12	6½ x 12
" Drivers	In.	11 x 15	11 x 15	11 x 15	11 x 15
" Trailer Truck	In.	6½ x 12	6½ x 12	6½ x 12	6½ x 12
Wheel Base, Driver	Ft. In.	13–10	13–10	13–10	13–10
" " Engine	Ft. In.	36–2	36–2	36–2	36–2
" " Engine & Tender	Ft. In.	74–8	74–8	74–8	74–8
Height, Deck Plate	In.	76	76	76	76
" Bottom of Drawbar Pocket	In.	34¾	34¾	34¾	34¾
Cylinder Spread	In.	89	89	89	89
" Dimensions	In.	27 x 28	27 x 28	27 x 28	27 x 28
Steam Port Dimensions	In.	2⅛&2 1/16 Wide	2⅛&2 1/16 Wide	——	——
Valve Travel	In.	7	7	——	——
" Lap	In.	1 5/16	1 5/16	——	——
" Type		15" Piston	12" Piston	Poppet	Poppet
" Gear Type		Wals'h't	Wals'h't	Franklin Oscillating	Franklin Rotary
Steam Pressure	Lb. per Sq. In.	205	205	205	205
Boiler Type		Belpaire Wide Firebox	Belpaire Wide Firebox	Belpaire Wide Firebox	Belpaire Wide Firebox
" Diam., Minimum Internal	In.	76⅝	76⅝	76⅝	76⅝
Flues and Tubes, Number		236, 40, 160	236, 40, 160	236, 40, 160	236, 40, 160
" " " O. Diam.	In.	2¼, 5½, 1½	2¼, 5½, 1½	2¼, 5½, 1½	2¼, 5½, 1½
" Length between Sheets	In.	228	228	228	228
" Fire Area	Sq. Ft.	8.39	8.39	8.39	8.39
Heating Surface, Ext. Flues	Sq. Ft.	3736	3736	3736	3736
" " Int. Superh'ter	Sq. Ft.	943	943	943	943
" " Firebox	Sq. Ft.	347	305	305	305
" " Total	Sq. Ft.	5026	4984	4984	4984
Grate Dimensions	In.	79⅞ x 126	79⅞ x 126	79⅞ x 126	79⅞ x 126
" Area	Sq. Ft.	69.89	69.89	69.89	69.89
Wt. on Rail, Engine Truck	Lb.	54100	53200	71630	62690
" " " 1st Drivers	Lb.	71900	68400	70500	69160
" " " 2nd Drivers	Lb.	71400	71100	72850	69660
" " " 3rd Drivers	Lb.	66500	69800	73580	69160
" " " All Drivers	Lb.	209800	209300	216930	207980
" " " Trailer Truck	Lb.	59200	57500	52020	57070
Wt. of Engine, Working Order	Lb.	323100	320000	340580	327740
" " " Empty	Lb.	288100	284500	305500	293000
Starting Tractive Force Main Eng.		44460	44460	44460	44460
" " " Booster		——	——	——	——
" " " Total		44460	44460	44460	44460
Factor of Adhesion–Main Engine		4.72	4.71	4.88	4.68
Remarks		Circulators	Standard Stoker	HT–Stoker	HT–Stoker
Class of Tender		110 P 75a	110 P 75a	110 P 75a	110 P 75a

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ROSTER

(AS OF JANUARY 1939)

8	830	1497	3655	7053	8161	
12	837	1517	3667-3684	7054	8165	
16	850	1522	3726-3775	7116	8181	
20	911	1526	3800	7133	8195	
43	920	1531	3801	7244		
122	945	1533	3805	7267	8212	
226	949	1546	3806	7270	8218	
227	958	1551	3807	7273	8225	
262	962	1554	3838-3889	7274	8236	
269	1120	1588	5022	7275	8240	
295	1139	1653	5038	7278	8242	
299	1188	1737	5041	7279	8251	
358	1195	1980	5058	7280	8261	
359	1329	1981	5072	7287	8278	
383	1330	1983	5077	7288	8281	
389	1339	1984	5086	7914	8309	
422	1361	1985	5147	7938	8334	
452	1392	2032	5154	8009	8347	
518	1395	2034	5238	8068	8373	
526	1433	2112	5243	8085	8377	
612	1435	2445	5253	8108	8378	
623	1436	2665	5296	8114		
646	1453	2673	5334-5399	8122		
669	1462	2761	5400-5474	8137		
719	1488	3654	5475-5499	8157		

The original Class K-4s locomotive weighed, in working order, 309,140 pounds, and developed on the test plant, for a period of 60 minutes, a maximum average of 3184 indicated horse-power, or one horse-power for each 97 pounds of locomotive weight. Over a middle power range it showed a water rate of 15.5 pounds and a coal rate of 1.75 pounds per indicated horse-power, with an overall thermal efficiency of approximately 7.4 per cent. At a speed of 70 miles per hour the dynamic augment on the rail is less than 30 per cent of the static weight on drivers. The valve motion, which is of the Walschaerts type, is of highly refined design with parts of minimum weight.

In heavy main line service, these locomotives make an average of 6900 miles per month, and a maximum of approximately 13,000. They average 85,000 miles between periods of heavy shopping, and during a recent period a locomotive was shopped after making 135,000 miles. No locomotives in this country have been more accurately or thoroughly tested, and it is no disparagement to any other locomotive of a similar type and capacity to say that none has a better all-around record for efficiency and reliability.

BALDWIN LOCOMOTIVES—July 1930

Seventy-five numbered 5400-5474 were built by the Baldwin Locomotive Works. All others were built by Pennsylvania Railroad.

It is interesting to note that there were 424 K-4's as late as the end of 1945. No. 8309 had been scrapped.

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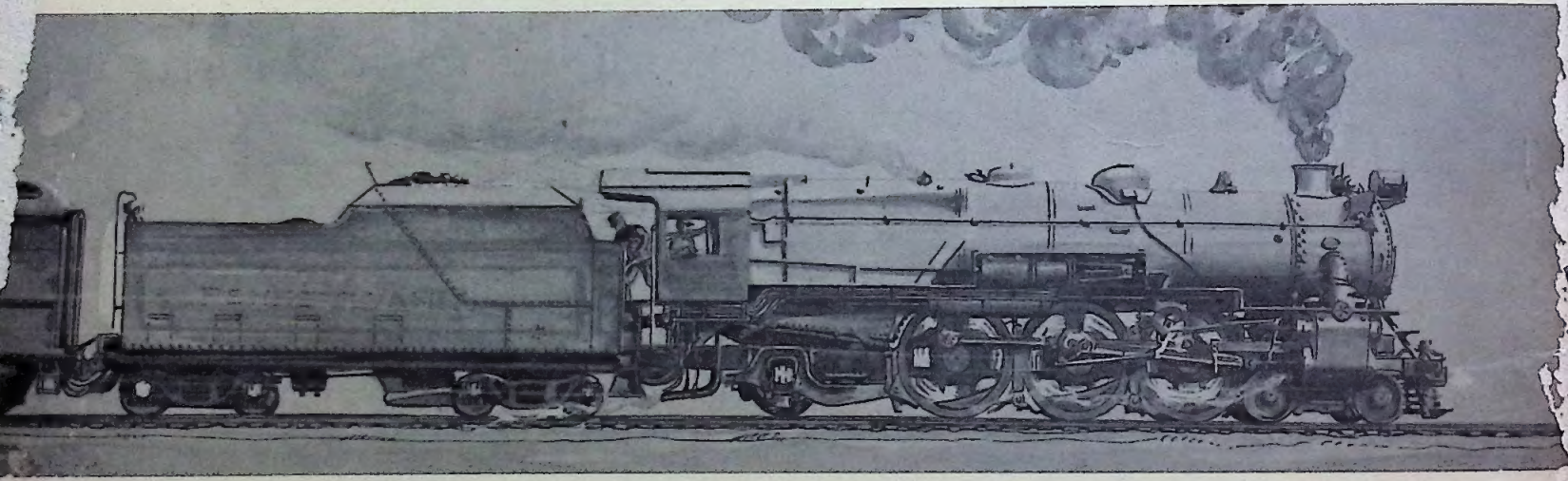

H. J. PALMER—1929